

Claims

What is claimed is:

- [c1] An electromagnetic induction logging method, comprising:
measuring electromagnetic induction response in earth formations surrounding a
wellbore, the measuring performed on an electrically conductive sonde support;
deconvolving the measured response with respect to a response of an instrument not
having an electrically conductive sonde support.
- [c2] The method of claim 1 wherein the instrument not having the electrically conductive
sonde support comprises an antenna arrangement substantially the same as an antenna
arrangement used in the measuring on the electrically conductive sonde support.
- [c3] The method of claim 1 wherein the deconvolving comprises embedded deconvolution.
- [c4] The method of claim 1 wherein the deconvolving comprises parameterized
deconvolution.
- [c5] The method of claim 1 wherein the deconvolving comprises iterative deconvolution.
- [c6] The method of claim 1 wherein the deconvolving comprises direct deconvolution.
- [c7] The method of claim 1 wherein the measuring comprises transient electromagnetic
induction.
- [c8] The method of claim 1 wherein the measuring comprises moving an instrument along the
wellbore using a drill string.
- [c9] The method of claim 1 wherein the measuring comprises moving the instrument along
the wellbore using an electrical cable.
- [c10] The method of claim 1 further comprising magnetically shielding an antenna system
disposed outside the conductive sonde support, the antenna system used to energize the

formations with electromagnetic radiation and to detect electromagnetic phenomena from within the formations.

- [c11] An electromagnetic induction logging method, comprising:
 - characterizing response of an electromagnetic well logging instrument having an antenna system disposed on an electrically conductive support within a known conductivity environment;
 - characterizing response of an antenna system and a circuit system physically arranged substantially the same as the antenna system and a circuit system within the well logging instrument, the characterizing performed in substantially the same known conductivity environment;
 - determining a convolution operator which causes the response of the antenna and circuit system to substantially match the response of the well logging instrument;
 - determining a deconvolution operator from the convolution operator;
 - measuring electromagnetic induction response in earth formations surrounding a wellbore using the well logging instrument;
 - deconvolving the measured response in the earth formations using the deconvolution operator.
- [c12] The method of claim 11 wherein the deconvolving comprises embedded deconvolution.
- [c13] The method of claim 11 wherein the deconvolving comprises parameterized deconvolution.
- [c14] The method of claim 11 wherein the deconvolving comprises iterative deconvolution.
- [c15] The method of claim 11 wherein the deconvolving comprises direct deconvolution.
- [c16] The method of claim 11 wherein the measuring comprises transient electromagnetic induction.
- [c17] The method of claim 11 wherein the measuring comprises moving an instrument along the wellbore using a drill string.

- [c18] The method of claim 11 wherein the measuring comprises moving the instrument along the wellbore using an electrical cable.
- [c19] The method of claim 11 wherein the known conductivity comprises substantially zero conductivity.
- [c20] The method of claim 11 further comprising magnetically shielding the antenna system from effects of the conductive sonde support, the antenna system used to energize the earth formations with electromagnetic radiation and to detect electromagnetic phenomena from within the formations.
- [c21] A method for logging while drilling, comprising:
 - rotating a drill string having a drill bit at a bottom end thereof in a wellbore, the drill string including an electromagnetic induction measuring instrument disposed in an electrically conductive drill collar coupled in the drill string above the drill bit, the instrument including at least one antenna and circuits coupled thereto for measuring an electromagnetic induction property of earth formations surrounding the wellbore;
 - measuring electromagnetic induction response of formations penetrated by the drill bit using the instrument; and
 - deconvolving the measured induction response with respect to a response of an instrument not having an electrically conductive sonde support.
- [c22] The method of claim 21 wherein the instrument not having the electrically conductive sonde support comprises an antenna arrangement substantially the same as the instrument disposed in the electrically conductive drill collar.
- [c23] The method of claim 21 wherein the deconvolving comprises embedded deconvolution.
- [c24] The method of claim 21 wherein the deconvolving comprises parameterized deconvolution.
- [c25] The method of claim 21 wherein the deconvolving comprises iterative deconvolution.

- [c26] The method of claim 21 wherein the deconvolving comprises direct deconvolution.
- [c27] The method of claim 21 wherein the measuring induction response of the formation comprises transient electromagnetic induction.
- [c28] The method of claim 21 further comprising magnetically shielding an antenna system disposed outside the conductive sonde support, the antenna system used to energize the formations with electromagnetic radiation and to detect electromagnetic phenomena from within the formations.